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FARMERS' BULLETIN 1253
UNITED STATES DEPARTMENT OF AGRICULTURE

SEED
PEAS
"FOR"
THE
CANNER



IN NO OTHER CROP-GROWING INDUSTRY is confidence between the seedsmen and the grower of greater value than in that of growing canning peas. It is with the belief that an intelligent understanding of the difficulties of the situation is the only true basis of confidence that this bulletin is written.

Some canners have had trouble recently in getting reliable pea seed, especially of the Alaska variety. This bulletin describes the care necessary to be taken by the seedsman in order that the varieties shall not change in character. Alaska peas can not certainly be identified by a sample of the seed, therefore the variety is an exceedingly risky one to be handled by the jobbing trade.

Seedsmen should not handle Alaska peas the stock of which they do not control, and canners should buy only from seedsmen who control and carefully guard their seed stocks.

Contribution from the Bureau of Plant Industry

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SEED PEAS FOR THE CANNER.

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PEAS, which are of European origin, came to America with the first immigrants and are now grown practically everywhere in the United States as a home-garden crop; they also enter into market gardening, trucking, and canning. Their relative importance in the last industry is very much greater than in the others, since pea culture is difficult and green peas do not carry well for long distances.

Dry peas are either smooth or wrinkled, and for cultural and culinary purposes these groups vary in much the same way as corresponding groups of Indian corn. The smooth-seeded type excels in hardiness and productiveness, but the wrinkled type is better in flavor and more desirable for table use. The wrinkled sorts are spoken of by canners as "sweet peas," just as wrinkled corn is called "sweet corn." Most present-day varieties of peas have white blossoms, as do all garden sorts used for shelling. Some field varieties have blossoms with various shades of purple.

Peas vary greatly in character of vine, from dwarf through semi-dwarf to tall. The shortest varieties are but little over a foot high, the mediums being from 2 to 3 feet, and the tall varieties reaching 8 feet under good culture. They differ also in the color of the split seed, some being green and others yellow. Field peas have been thought by some botanists to belong to a different species from garden peas and were called *Pisum arvense*, the garden pea being *Pisum sativum*. This distinction is now generally abandoned, and the latter name applies to all peas, whether used for field or garden purposes.

FIELD PEAS.

A "field pea," as the term is here used, is a pea grown for use as human or animal food in its dry state or grown either alone or with some other crop for forage or green manure. All the peas in the old botanical group of varieties called "field peas" had colored flowers. There has been a decided tendency in this country to abandon the culture of colored-flowered sorts, so that at present but few are grown in the United States or Canada. The name "Canada field pea" is variously used in different regions, sometimes to indicate a specific variety, but often to include all field sorts.

Dry peas are sold extensively in Europe as human food. They are most often prepared as pea soup. This use is apparently slowly on the increase here and might very profitably be greatly extended. For marketing as dry peas in this way green-colored sorts are preferred. Often also peas are marketed as split peas. In this case the seed is split, and the skins and germs are removed. Some green peas are used for this purpose, but most split peas are yellow, there being a belief that the yellow peas are better flavored than the green ones. Purple-flowered peas are grown only for green manuring and forage, or if thrashed are fed only to stock, as they always become dark on cooking and have a rather disagreeable flavor. All purple-flowered peas have more or less brown color or mottling on the ripe seed.

A variety to suit the requirements of a field pea must be hardy, productive, and not too short in vine. Therefore none of the dwarf or wrinkled sorts are grown as a farm crop for dry seed.

CANNING PEAS.

Peas have been used for canning for as long a time as any vegetable, and the beginning of the industry in this country probably was at Baltimore, Md., in the decade before the Civil War. At first, peas were bought in the pods in the city markets, shelled by hand and placed in cans. About 30 years later a French machine was invented for podding, or shelling, the peas. This very greatly increased the capacity of the factories, but peas were still bought in the pods. During the decade beginning with 1890 this podding machine was adapted and improved for handling the peas, vines and all, as cut in the field, thus eliminating a great amount of hand labor in picking the pods. This machine is now called a "viner" and is probably the most important single invention among the many used in the pea-packing industry. At Baltimore some factories still find it profitable to depend on the markets for their supply of peas, purchasing them in the pod and using the French podding machine. They thus serve as stabilizers for the market-garden industry and assure the growers of peas a sale for their product.

REQUIREMENTS OF A CANNING PEA.

To be a good canning pea a variety must, first of all, be productive. This will include its being hardy if it is to be grown in the southern portion of the pea-canning region and will exclude very dwarf types. Second, all plants must ripen uniformly. Third, all pods on individual plants must be in usable condition at one time; that is, none must be too ripe or too immature. This can be influenced somewhat by the rate of seeding. This requirement tends to exclude varieties with too great a length of vine. Fourth, the seeds should remain green after processing. This requirement relates to appearance only, since it is not claimed that the green-seeded peas are of higher quality; in fact, the reverse claim is often made. This eliminates the yellow-seeded peas. Fifth, within the list of varieties possessing the four characters enumerated, high quality gives preference. Before the advent of the viner the second and third requirements were not so important as now, since the pods were hand picked. The viner therefore has had a decided influence on the list of varieties of peas used for canning.

Figures obtained by the Food Administration on canners' operations for the year 1917 indicate that the following varieties were used in the percentages shown:

Smooth peas:		
Alaska	-----	55
Wrinkled peas:		
Horsford group	-----	28
Horsford Market Garden	-----	18
Advancer	-----	8.
Little Gem	-----	1
Perfection (Davis)	-----	1
Admiral	-----	13
Surprise	-----	2
All others	-----	2
Total wrinkled peas	-----	45

The Alaska holds its predominant position in this list for several reasons. It is hardier and a more reliable cropper than the wrinkled varieties, so that in the southern part of the canning region it is the only variety used. This southern portion includes Maryland, Delaware, New Jersey, and the southern parts of Ohio, Indiana, and Illinois. Even in the more favorable climate of Wisconsin, Michigan, and New York a large acreage of Alaska peas is planted, since here this variety is matured and packed before the earliest of the wrinkled sorts is ready for use. The season for packing peas is thus lengthened, which is of great importance from the packers' standpoint. The Alaska is deep green and retains its color after processing, with no light-colored peas. Hence, it is quite likely to retain its position as

the cannery leading variety unless it is superseded by some other more desirable smooth green-seeded pea.

The wrinkled varieties are by no means so well fixed in their relative positions as is the Alaska. There is probably a tendency toward a relative increase of wrinkled peas as a group in competition with the Alaska variety. This is apt to occur as the consuming public become better educated as to quality in canned peas. The varieties listed in the Horsford group are very closely related and may trace to the same original stock.

Before the advent of the viner, many other varieties were grown, such as the Telephone, White Marrowfat, and Kentish Invicta. The Kentish Invicta has been replaced by the Alaska, and the other two varieties mentioned were too long in vine and ripened through too long a season and so have dropped out.

The question is sometimes raised why some of the green-seeded, white-flowered varieties of field peas would not make good canning sorts. The varieties most frequently suggested for this purpose are the Prussian Blue and Blue Bell, these two being almost identical. The answer is easily given. They do not have any of the advantages of the Alaska for present-day processes. They would be too late for the southern tier of States, southern Illinois to Delaware, and would shorten the season for a successional crop on the same ground. They do not mature their crop all together, so that they would have all stages from blossoms to dry peas on the plants at the same time. This would give an unsatisfactory crop of peas, since they would be hard to grade. Moreover, for the States from Wisconsin to New York they would not extend the canning season, but would mature with the more valuable wrinkled varieties. Thus they lack some of the main characteristics which make the Alaska a desirable canning sort. It is difficult to see any reason for attempting to grow these varieties for canning anywhere.

SEED-PEA GROWING.

The production of seed peas for the canning and market-garden trade is probably the largest seed-growing enterprise in the United States. It has a very high crop risk and has been very migratory.

It began in Canada, and New York later became the center of the industry, which steadily moved westward through Michigan into Wisconsin. That State for a long time was the main region for seed peas and is still an important producer. From Wisconsin, the industry has continued to move westward, and nearly every region where peas might be grown, irrigated or not, either is now producing seed peas or their cultivation has been abandoned after trial. California is one of the most recent regions to be used for growing seed peas.

They are grown there as a winter crop. The larger seed-growing companies are searching continually for new regions. The most certain prediction for the next 20 years of the pea-seed industry would be that a number of regions at present unthought of for the purpose will be growing seed peas. Though not a sure crop in any region, it is more certain under irrigation than elsewhere. The considerations which have caused all this movement involved the disease, insect, and economic relations of the crop.

The seed-growing industry has always been confined to northern latitudes or high altitudes. The main western regions now being used are the Bitter Root Valley and the Gallatin Valley in Montana, the Upper Snake River Valley of Idaho, the Palouse region of eastern Washington and western Idaho, and the regions about Sacra-



FIG. 1.—A small crew of seven men roguing a field of peas sown with a grain drill. The foreman is back of the line, where he can find rogues missed by the men.

mento and Half Moon Bay in California. Seed peas have been grown for a number of years on the mainland bordering Puget Sound and on the islands of that sound, but because of the moist climate and consequent difficulty of curing the crop in occasional years the industry has not increased there. This is also an important field-pea region, and there is consequently danger of undesirable mixture.

In Wisconsin, the peninsula between Lake Michigan and Green Bay has been a very important producing center.

Peas for seed are sown with a grain drill (fig. 1), whether for dry land or irrigation farming, except certain of the more dwarf garden varieties, which are sown in rows for cultivation (fig. 2). Irrigation when the peas are drilled is by furrows, as for wheat, these furrows being planned to take advantage of the slope.

Peas are often grown by seedsmen for two or three years or even longer on the same fields with increasingly good results, but there is serious danger in this case of disastrous diseases.

While there is not at hand much exact evidence, it seems doubtful whether the irrigation of a seed crop has any effect on the canners' crop of peas grown therefrom.

In estimating the size of his plantings, a seedsman is in the habit of counting on a fivefold return only. This small return is often exceeded, but it is too high for the crop from whole regions in occasional years of low return. The seedsman sows about 3 bushels of



FIG. 2.—A field of short-vined peas grown for seed and planted in rows for intercultivation. Harvesting and the thrashing of small stocks are in progress.

peas per acre, giving him a return of 15 bushels, of which 3 must be kept for stock seed, leaving him 12 bushels to sell. The eastern grower for the canner plants 4 or 5 bushels per acre, so that the average seedsman's acre of peas will supply not more than 3 acres for the cannery.

A similar computation based on average conditions for the two other important canning crops, sweet corn and tomatoes, would be as follows: An acre of seed sweet corn yielding 40 bushels would provide seed for 160 acres of canning crops, and similarly an acre of tomatoes yielding 100 pounds of seed would produce sufficient seed to plant 1,600 acres in canning crops. The above ratio of increase clearly indicates the relation of the seed crop to the canning crop which must be maintained in order that the important food output of canned peas may be produced.

MIXTURES AND ROGUES.

To make an acceptable stock for the grower, peas must be uniform, and the more nearly all the plants of any lot approach the type of the variety the better and the more salable the strain will be. Seedsmen must guard this uniformity from various dangers, some of which are as follows: (1) Warehouse mixture. There should be little excuse for this, yet it takes great vigilance to prevent varieties from being mixed in thrashing and warehouse machinery when many varieties are being handled. (2) Volunteer plants. If field peas have been grown on a piece of land, seed will often lie in the soil over winter and will appear as a volunteer crop in a following crop of seed peas. This may occur even if one or more crops of small grain have intervened between the crop of field peas and the seed peas, as the volunteer peas will grow, ripen, and increase with the grain. The wrinkled varieties of peas will rarely live over winter in this way. Because of the danger of volunteers from the hardy sorts, careful seedsmen hesitate to plant seed peas for cannery purposes in regions where large acreages of field peas are grown. (3) The most difficult mixtures to control are those spoken of as rogues. Often rogues are degenerate in character and have at least the appearance of being a return toward an unimproved type of pea. Not all varieties are equally liable to produce rogues, and some varieties rarely show them.

To the seedsman the term "rogue" often refers to any undesirable type found growing in his fields, and the process of removing these plants is called "roguing." These terms are applied to other seed crops as well as peas. Usually seedsmen distinguish between mixtures of recognizable varieties and rogues. "Rogue" has been used in technical publications in England and in this country to indicate a particular degenerate type of pea, called by American seedsmen "rabbit-ear rogues." Rogues, then, may be degenerate peas of uncertain origin, reversions to type, or crosses. Field crossing in peas is very rare under normal conditions, though instances have been reported where such crossing has seemed to be considerable. The danger from natural crossing is usually disregarded by seedsmen. Roguing, or the removal of aberrant plants from a stock, must be done when the particular variation being sought for can be most plainly seen. This basis of rejection may depend on the vigor of the plant; its habit, whether branching or not; the shape, size, or color of the leaf; the color of the blossom; and the size, shape, or curvature of the pod or whether the pods are produced singly or in pairs on the blossom stems. Rabbit-ear rogues are found in some of the most highly developed wrinkled peas and have much smaller, narrower stipules and leaves than the varieties in which they occur. These have been studied in

England and America, and it has been found that a plant which has once become such a rogue apparently never reproduces the type of the parent variety.

The time when roguing can best be done will vary. Some rogues can be seen best when the plants are small; others only when the crop is ripening or at some stage between these two conditions. Some rogues will be readily seen, and others will require long experience to find. The most difficult of all rogues to remove is probably the one which only differs in pod characters. Some crops must be rogued at two different times.

As might be supposed, not every laborer can make a satisfactory member of a roguing gang, since close observation and an ability to see very slight differences in plant characters are required. Where possible, men who have worked at roguing for more than one season are engaged. Recently, such experienced men have been very difficult to obtain.

A roguing gang usually consists of 12 to 15 men, under a foreman. (See fig. 1.) A 15-man crew is arranged for work as follows: Twelve of the men are placed in line, so that when their arms are extended the finger tips of adjoining men will touch. They proceed straight across the field with stakes as guides, keeping the proper distance apart. Two of the most experienced men are placed in a second line, one to follow each six men in the front line and to get any rogues which they miss. Lastly, the foreman ranges back of the whole gang, advising and explaining what is to be pulled, and removing any rogues he can find. Sometimes the gangs can only work with the sun at their backs, so as to get the best lighting. When pulled, these rogues are carried out of the field, and are preferably fed to stock, so as to prevent any chance of their being returned. In work requiring the most care, a gang of 15 men can only be counted on to cover 15 acres a day.

There is also another resource left to the seedsman for purifying his seed stocks. This is his warehouse machinery. Sieves in a fanning mill may be used to separate peas too large or too small for the variety, and any variation which shows in discernible seed characters may be picked out on the picking table.

WHAT TO ROGUE.

The most careful seedsman will put his main emphasis on his stock seed, keeping that as pure as his best vigilance can make it. Then, if there are no volunteers to be pulled out, it is not necessary to go over fields the seed of which he expects to sell. Indeed, if he attempts to rogue his whole commercial planting there will be at least a tendency toward lax roguing on his stocks, and if his commercial plantings really require roguing it shows lack of care in han-

dling his stock seed. It is certainly best for the canner that the seedsman confine his attention to his stocks, since he can thus deliver the best and most even seed. There is a widespread demand by the canner that he be sold seed from rogued fields. This is based on a misconception, for which in all probability both canner and seedsman are to blame. Also the seedsman will very rarely sell any of his stock seed, and it is best for the canner that he should not. If his stock seed has had sufficient eare it can only be sold at an advanced price. Keeping in mind the very high ratio of seedsmen's plantings to canners' plantings, 33 per cent, it is easy to see that the seedsman will have use for all the stock seed he can properly rogue.

INDIVIDUAL PLANT SELECTION.

In occasional years of near crop failure the seedsman may be glad if he is able to retain his stock seed. With very short crops roguing



FIG. 3.—A small threshing outfit being used on small lots of peas resulting from individual selections.

is not possible, and after one or two such years when a good year returns the roguing will be very heavy. The best that can be done by roguing is to attain approximate purity, since some undesirable plants will always escape. It therefore becomes good business to go back to single plants as progenitors of new lines, since money may thus be saved on roguing expense. This is a long process, however, taking from six to eight years from the beginning of a single plant selection to the time when this new stock can be substituted for the old. Small threshing outfits are used for threshing these small stocks of peas (fig. 3).

ROGUES OF ALASKA PEAS.

In the case of the Alaska pea there are various stages in divergence from type. All Alaska rogues, however, are larger, later, and often more productive plants than the true variety. Not sufficient evidence is on hand to state whether a plant which has only started on this downward path will produce some progeny which are true Alaska peas, but it does seem certain that the confirmed rogue will not produce the true variety. Some plants of true Alaska are apparently continually producing these variant types, which end by being rogues. Therefore, in order to keep any strain of the Alaska variety true, careful work on stock seed is required. These divergent plants must be detected as soon as possible and removed from the strain. This will require all the closeness of discernment of which the seedsman is capable.

These divergent plants can best be seen as the crop is ripening, when the leaves of the true Alaska plants are turning yellow. The rogues, being stronger and later, will stay green and will then show most plainly. In ordinary seasons there are about 10 days in which this work can be done in any one field.

FARMERS' STOCKS OF ALASKA PEAS.

There is another and a very important point in connection with Alaska peas. The variety being smooth seeded (it is usually slightly pitted) and in many ways very much like field varieties, it makes a good field pea. Farmers in Wisconsin and in parts of the West have kept their own seed, growing it without roguing; in fact, for a field pea the more rogues a stock of Alaska has the better type it will be. These stocks may keep the name Alaska, but may have lost practically all their true Alaska plants. There are to be found stocks of this kind which are so different that it is a question needing further study whether they trace to Alaska or not. It is very difficult, if not impossible, to distinguish these spurious Alaska peas from the true variety by the characters of the ripe seed (fig. 4). They are, however, a recognized field pea, often under the name Alaska, in the regions where grown, and, moreover, are distinct from other green-seeded field peas, being earlier than Prussian Blue, Blue Bell, or Scotch Blue, which are the varieties most like them in the dry seed. Being grown as field peas and carelessly thrashed with custom machines, these stocks become mixed with other field types. If these mixtures happen to contain varieties with colored flowers, the peas from these will turn dark on processing when canned and will darken the liquor in the cans. A small-seeded, colored-flowered field variety called Bangalia (see the illustration of its seeds on the cover) has been so mixed, and has caused heavy loss.

These spurious stocks damage the canner and the grower for the cannery in various ways.

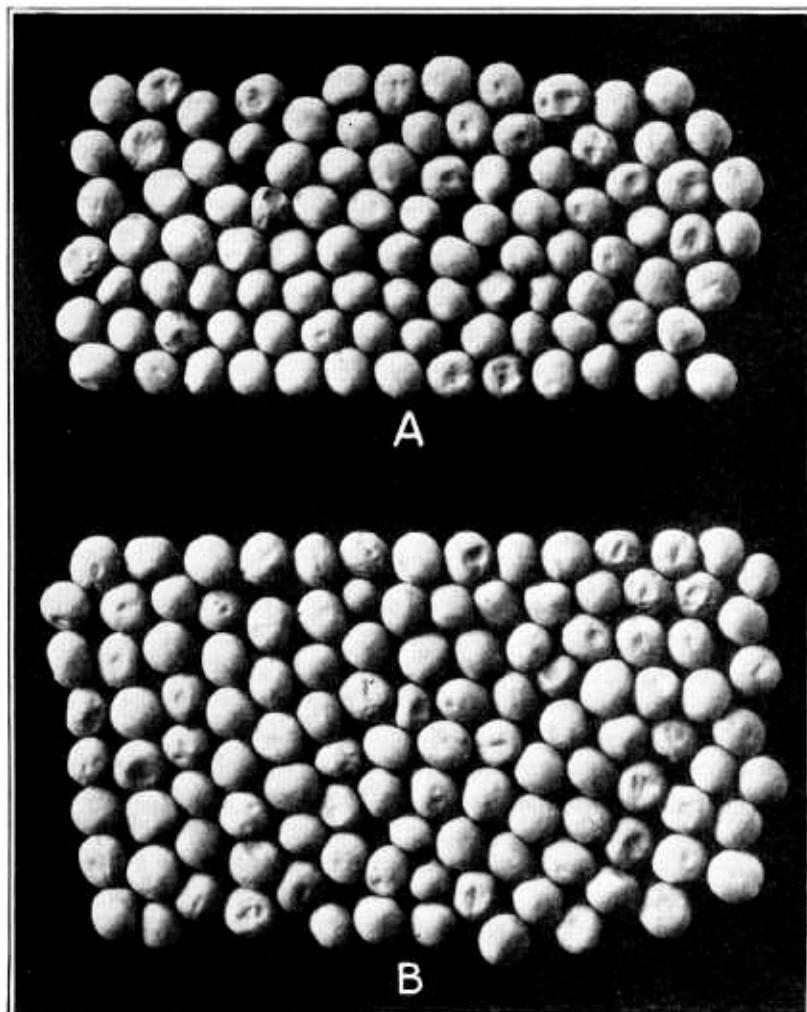


FIG. 4.—Genuine and spurious Alaska peas. Growing tests have shown that A produces a good, even strain of the Alaska variety, while B produces a large proportion of late, long, spurious Alaska plants. This shows the practical difficulty in recognizing the strains from seed samples.

DAMAGE DONE BY SPURIOUS ALASKA PEAS.

- (1) In regions where the Alaska is the only variety canned, the crop is off the ground in time for a succession crop, sometimes a canner's crop of sweet corn or dwarf Lima beans. Late peas if allowed to mature so as to harvest may defer the succession crop so

long as to prevent its being planted. Even where the late peas may be off in time for planting the succession crop, the spurious seed very seriously discommodes the farmer, as the plants throw his pea-harvest season into the time when all his labor is needed for wheat harvest or corn cultivation.

(2) Being very long, heavy in vine, and late, the spurious Alaska peas do not ripen simultaneously and will rarely give more than a very small crop of usable peas at any one time.

(3) If mixed with purple-flowered varieties, some peas will darken on processing and the liquor will be dark, so that the canned peas will not be salable.

(4) Most important of all is the loss of confidence and good will between the canner and his growers. This is a loss which may take years to repair and can not be estimated.

The losses from these spurious Alaska peas to the trucker or market gardener are only slightly less than to the canner. While he picks by hand and will be able to get the best crop the vines will yield, yet he will lose the early market, for these peas will be from 10 days to two weeks later than the true Alaska variety.

PRECAUTIONS.

As to the precautions which a purchaser may take to avoid the danger of getting this spurious Alaska seed, he can grow all or part of his own seed if he is in a region suited to growing seed peas. It is very doubtful whether it is at all practicable for the canner in the southern parts of Illinois, Indiana, and Ohio and in Maryland, Delaware, and New Jersey to grow his own seed. The seasons are too precarious and the danger from weevils too great. Some of the best Wisconsin canners grow a part of their own seed. They do not rogue, and they renew their stock every two or three years from a seedsman. They get in this way a knowledge of what they are planting by observing the stock seed the first year after its purchase from the seedsman. If it is not satisfactory they may can it rather than save it for seed. These men are not seedsmen and still depend on the seedsman for their stocks. Canners do not wish to become seedsmen.

There have been seed-pea jobbers who have handled Alaska seed without controlling any stock seed of their own. This is at best a very risky business, since it is practically impossible to distinguish the Alaska variety by sample (see fig. 4). The price of seed peas is a comparatively heavy item of expense in growing a crop, in comparison with other canners' vegetables, and it is natural that canners should wish the price to be as low as possible for good service. But it is easy under present conditions to push the bargain for seeds so

far that it becomes a very bad bargain for the canner. Some few seedsmen see in the canner a man who looks only at the price he pays for his seed, disregarding quality. Some few canners see in the seedsman or seed dealer a man intent only on making a sale, regarding the seed only as merchandise, with no care as to quality. There are possibly a few such canners and a few such seedsmen, but the number of each has been greatly overestimated, since both attitudes are very short sighted from a business standpoint.

To a seedsman there are two all-important things: His stock seeds and the reputation based on those stocks. No vegetable crop is conceivable in the growing of which the purchaser must depend more completely on the good faith and reliability of his seedsman than peas. Therefore, in no seed enterprise is a reputation for uniformly good seed and honest dealings a greater asset to a seedsman. No seedsman can afford to buy Alaska peas on sample. Their identification is too uncertain, and he has too much at stake in his reputation. It is safest for the seed-growing seedsman not to purchase seed of the Alaska variety the stock of which he does not control.

The canner buys in sufficiently large quantities to buy direct from the seed-growing seedsman. He should realize more than he does the risk he takes in buying seed of Alaska peas whose history he can not completely trace; also that Alaska seed in the dry state can not be certainly identified. He will be in a much safer position if he buys only from seed growers who control their own stocks.

Unless there is some very decided advantage to the farmer in growing the spurious Alaska peas as a field-pea crop, their culture should be strongly discouraged, their place being taken by some other green-seeded field pea. As already pointed out, all field peas are objectionable to the seedsman in his seed-growing region, because of the danger of their volunteer growth in succeeding crops. These spurious Alaska peas would be especially bad in this way, and there will always be the danger that they may be substituted carelessly or by design for true Alaska stock. Any locality hoping to build up a reputation as a seed-pea region would be very greatly handicapped by growing this so-called Alaska as a field pea.

DESCRIPTION OF ALASKA PEAS AND SPURIOUS FORMS.

The true Alaska variety is described as follows:

Stem 2 to $2\frac{1}{2}$ feet high, never branching; leaves medium size, light yellowish green in color; flowers white, usually solitary, beginning to appear at the sixth to eighth joint of the stem; pods straight, end blunt, well filled with seeds, three to six to a plant; season very early, each plant ripening all its pods very nearly at the same time. Dry seed, green, may be all smooth, but usually shows many pitted seeds, these characters being apparently much influenced by climatic conditions. (See fig. 4, A.)

The following is a description of spurious Alaska peas:

They vary from the true Alaska variety in that the stocks are usually mixtures, with no well-marked type. All plants are later and larger growing. They do not begin to put on blossoms until the tenth or twelfth joint and continue growth and flowering for an indefinite period if weather permits. All gradations from blossoms to fully ripe pods are to be found on the same plant. The leaves are larger and of a darker green color than those of the true Alaska variety. The stems are often branching and sometimes attain a height of 6 feet. Pods vary, but are usually straight. Blossoms white, or may be mixed. Seed not distinguishable from those of the Alaska variety, except those from the colored-flowered plants, which, when present, are often smaller than Alaska seed, angular, and very light greenish brown in color. In season they are from one to two weeks later than the Alaska variety. (See fig. 4, B.)